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ABSTRACT

Ideas for technical writing assistance and resources that are available to Purdue University faculty who incorporate a writing component into their courses are presented in this guide. Following an introduction containing the purpose, background, and scope of the guide, three main topics and their subtopics form the guide's structure: (1) "Instructional Assistance" presents guidelines for developing technical writing assignments, suggestions for evaluating student papers, and standards and specifications for good technical report writing; (2) "Writing Lab Assistance" discusses teaching help, consulting help, and instructional materials in composition that the writing laboratory makes available to faculty and students; (3) "Computer Aided Assistance" describes word processing and text editing, and gives a digest and an evaluation of the Writer's Workbench program. Appendixes include information on technical writing style, report formulas, and illustrations. (EL)

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A Handbook for Faculty at Purdue

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TECHNICAL WRITING RESOURCES

Madelon Cheek

CS209324

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A Handbook for Engineering and Technology Faculty at Purdue

TECHNICAL WRITING RESOURCES

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INTRODUCTION

Purpose - This handbook presents technical writing assistance and resources that are available to Purdue University faculty who incorporate a writing component into their course structure. It does not cover writing courses that are offered at Purdue University.

Background - Several engineering and technically oriented courses at Purdue University have a writing requirement as part of the course structure. The faculty in charge of these courses are concerned about writing competency and recognize the increasing demand in government, industry, business, and academia to produce clear, concise, accurate technical reports. Students in these classes possess a wide range of writing abilities. Therefore, in order to achieve the desired level of writing competency in their courses, faculty search out supplemental writing instruction. One source of such assistance is the English Department's Writing Lab which offers tutorial instruction in writing skills and provides various types of help in composition instruction to interested faculty. This method of working across the curriculum to improve writing has proved educationally beneficial to both students and faculty. To enhance this process, this handbook provides an organized overview of technical writing assistance offered to the faculty through the Writing Lab and presents specific guidelines which can be used in assigning and evaluating technical reports. It also discusses computer aided instruction, specifically word processing, text editing, and Writer's Workbench.

Scope - This handbook focuses on technical writing and is intended to help faculty at Purdue University who incorporate writing in engineering and technically oriented courses. The material should be useful to other faculty, e.g. agriculture, computer science, business, etc., who require technical reports from their students. Information about composition classes is not included in this text.

Plan of Development - Three main topics and their sub-topics form the basic structure of this handbook:

Instructional Assistance presents guidelines for developing technical writing assignments, suggestions for evaluating student papers, and standards and specifications for good technical report writing.

Writing Lab Assistance discusses teaching help, consulting help and instructional materials in composition which the Writing Lab makes available to faculty and students.

Computer Aided Assistance describes word processing and text editing and gives a digest and an evaluation of the Writer's Workbench Program.

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INSTRUCTIONAL ASSISTANCE

Structuring Effective Writing Assignments

The basic goal of all technical writing is "TO COMMUNICATE." To help accomplish this goal, technical writing assignments should clearly and concretely designate the following:

CONTENT - What is the student to write about? What will the work be about?

Standard - The intended CONTENT of the work must be articulated.

AUDIENCE - Who is the student writing for? Who is the intended audience?

Standard - The persons who are expected to read the work must be specified.

OBJECTIVES - Why is the student producing this work? What purpose is the report intended to achieve?

Standard - The reasons for producing this writing and the educational value of this work for the student must be presented.

CRITERIA - How will the assignment be evaluated?

Standard - The basis for determining the extent of success achieved in the writing assignment must be set forth.

Together these four standards define the writing assignment for the student. To further assist in structuring effective assignments, a brief discussion of the specifications within each standard are given and assignment examples are presented. The specifications for evaluating student writing are discussed in the following section.

Content — What is the writing about?

In technical writing, report formats define the writing content. There are many varieties of reports used for many different reasons; therefore, some flexibility is desirable. However, major formats have general acceptance, and an analysis of the questions addressed in these report formats indicates the content and purpose of that writing. Thus, one approach to use in specifying a report assignment is:

- consider what type of questions the report should answer
- determine which report format addresses these questions
- state a specific, clearly defined purpose based upon that format

Table 1 outlines the necessary data for determining report formats.

TABLE 1
REPORT FORMATS

Report Type	Questions Answered	Purpose
DESIGN	How does it function (work)? What does it look like? How is it to be constructed?	To present a design with methods of construction and an evaluation of the project.
FEASIBILITY	Will it work? Can this be accomplished? Is it suitable or appropriate? Which alternative is better?	To present the practicality of a given project, or to furnish information on which a choice can be made between alternatives (comparison/contrast).
PHYSICAL RESEARCH	Is it theoretically possible? What new is being added?	To answer a theoretical question. To present new data in an area of research or design.
PROPOSAL	What can be accomplished? What can we do?	To present or suggest potentials. To offer something new.

PROGRESS	What has been accomplished? What needs to be done? How far along is this project?	To present information about the status of a project. (There is an assumed beginning and end.)
MANUAL	How to?	To instruct or to tell someone how to do something. To explain in detail processes and procedures.
STATUS REPORT or CASE HISTORY	What problem exists? How can a problem be solved?	To describe a person, place or organization and to present an analysis and solution to a problem if one exists.
LABORATORY REPORT	How were specific findings or results achieved? What is their significance?	To present materials, procedures, and methods used in solving a specific problem and to evaluate the importance of results.
JOURNAL ARTICLE	What can I add? (Also, any of the questions given for other formats).	To present professionally to a specific journal or magazine information, questions, analysis, and criticism regarding a topic.

Audience - Who reads technical reports?

The audience for technical reports can be divided into three general groups:

- Lay Reader - anyone who is reading outside of his/her field of expertise; we all are lay readers at some time. This group represents persons who are interested in reading a report for information or for entertainment but who are not experts in the field. The Lay Reader often approaches reading with enthusiasm, curiosity, and a desire to learn -- this group can be a writer's most responsive audience. This audience requires: 1) definitions of specialized and highly technical terms, 2) explanations though the use of analogy or illustration, and 3) a minimum use of technical jargon.

- Expert/Technician - anyone with the specialized training and experience needed to understand the technical terms and scientific data used in a report. This audience represents a spectrum of education, training and expertise. Experts will be interested in complex and detailed theory whereas technicians are apt to be more concerned with specific applications of information. When writing for this audience, the author should carefully organize reports so that readers can easily and quickly access information relevant to their particular concerns.

- Executive/Manager - anyone who has decision-making power regarding the writer of the report or the information presented in the report. This group reads in order to form judgments, to gather information on which to base decisions, or to determine the significance and implications of a work. This audience often represents the most crucial group of readers for any specific report and requires that writers produce accurate, brief, and complete reports in order to achieve the final objective of technical writing -- clarity of presentation.

A formal report is usually written for more than one audience or group, and various sections of a report format reflect the need to address diversified readers. In assigning student reports, the instructor always represents the executive/manager (someone with decision-making power) and may also act as an expert/technician or lay audience. In giving assignments, the instructor should clearly specify the audience in order to help writers produce focused report writing.

Objectives - Why write this report?

Technical report writing includes both content and form; together these create the overall student objectives for an assignment. Following is an illustrative listing, NOT EXHAUSTIVE, of general and specific objectives which could be included as the writing objective component for a technical report assignment. The general objectives refer to goals expected of advanced students or to final objectives to be achieved by the end of semester. For students writing reports in higher-level engineering courses, these objectives are basic requirements for all professional report writing.

General Objectives (may be cumulative) - The student should be able to:

- Write in accepted technical writing style. (see Appendix A)
- Present the report using an acceptable format. (see Appendix B)
- Use and correctly label illustrations and calculations. (see Appendix C)
- Write in standard English using correct grammar.

Specific Objectives (should be used selectively) The student should be able to:

- Write an informative abstract for the report.
- Write a descriptive abstract for a journal.
- Present a series of data in table form.
- Draw and correctly label a figure.

- Change passive voice into active voice.
- List a series of items in parallel form.
- Use an analogy to define a technical term.
- Write a glossary of items using parallel structure.
- Describe accurately and concisely a mechanical device or process.
- Identify and eliminate unnecessary redundancies.
- Quantify and specify data -- omit vague words.
- Present a multiple evaluation table in correct form.
- Write an introductory summary for a report.
- Identify and change pronouns when referents are vague or pronouns are incorrect.
- Make evaluative judgments in the form of recommendations.
- Draw conclusions from data presented.
- Include an appendix.
- Present a reference (bibliography, literature cited, etc.) section in correct form.

Evaluating Writing Assignments

Criteria - How will this assignment be evaluated and graded?

When giving a technical writing assignment, the instructor should tell students what criteria will be used in evaluating that assignment and how a grade will be determined. Written comments, assigned percentages, specified points, or a combination of these are frequently used in determining a grade.

In evaluating students' reports some general guidelines which might prove useful are:

- GIVE positive responses. Encouragement and praise often motivate students to improve their writing.
- TELL students if revision(s) is acceptable and how this will affect their grades.
- RETURN students' writing assignments as promptly as possible. Generally, if a series of assignments are required, a student should receive the evaluation from one before the next is due.

In terms of setting specific criteria, many different approaches are used. One method described in this text which is useful for evaluating technical reports uses questions posed in different categories or levels of writing. A description of these categories and questions follows.

Holistic Evaluation - An overview. Does the writing COMMUNICATE information clearly, accurately, concisely? Are both form and content presented professionally? Overall, is the purpose or goal of the assignment met?

Rhetorical Evaluation - Language, structure, and organization. Does this report communicate EFFECTIVELY using appropriate language, form, and correct report format?

Generally is this writing

- appropriate? (see Appendix A)
- consistent? (Omits unnecessary tense shifts? Maintains use of same person throughout? Uses same design style and graphics for headings and subheadings?)
- integrated? (Uses transitions within/between paragraphs? Writes sentences based on old-new information theory?)

Syntactical Evaluation - Sentences. Does the report use complete sentences, sentence variety, and well-developed paragraphs?

Sentences - Sentence fragments are permitted only in lists, headings, and labels. Are sentence structures written so that cause-effect relationships are clearly and correctly presented?

Sentence Variety - Are simple, compound, complex, and compound-complex sentences used?

Paragraphs - Do paragraphs have topic sentences, development, summaries, and transitions?

T(topic sentence)
E(expansion) the Paragraph
S(summary)
T(transition)

Grammatical Evaluation - Punctuation and Spelling. Are the rules of grammar followed? Are words spelled correctly?

Stylistic Evaluation - Style and Form. Is the report written in an objective tone - avoids judgmental, moralistic, and emotional writing? Is diction and word choice in standard English-avoids cliches, colloquial expressions, unnecessary jargon, and dialect? Is the report written in the third-person (the operator, the mechanic, the researcher, etc.)? Does the writer use active voice for sentences whenever possible? Does the writer use listings (in parallel form), illustrations, and headings, to facilitate reading?

In summary, is the report accurate, brief, and complete in order to achieve clarity of presentation? For a more detailed discussion of technical writing style see Appendix A.

Writing Examples

*Content	Present in a formal report the design of a circuit which will output 0-5 volts, given a 0-1 volt input.
Audience	This report should address 1) the technican who will be responsible for implementing the design and 2) your engineering supervisor who will be responsible for evaluating your work.
Objectives	The design will be used in the modification of an electronic breath analyzer. Your work should demonstrate clear understanding of the logic and theory needed to solve this problem, and it should demonstrate your ability to order and present prose, illustrations, and calculations in an acceptable technical design format.
Criteria	Grading: 60% content (logic and organization, correctness, completeness)
	40% writing (language and grammar, technical writing style, professional presentation)

*This assignment is modeled after a design problem given in EE 207.

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Content	In a formal report determine whether "Think Tank" or "THOR", two thought-processing computer programs, is more applicable for technical and engineering students to use in the prewriting stage of composing technical papers.
Audience	1) Experts in writing will read this report to help decide which program to use in tutoring students. 2) Students will read this report as a way to evaluate which program might help them improve their writing.
Objectives	This report will be used to determine which program should be purchased for a Writing Lab microcomputer. Your report should show an ability to: 1) Present criteria, 2) Use and present criteria in a multiple evaluation, 3) Recommend alternatives based upon established criteria.
Grading	Grade for report = 100 pts.

Content - 50	Description of Problem Description of Computer Programs Presentation of Criteria (Standards and Specifications) Presentation of Methods and Evaluation Recommendations
Language-25	Rhetoric Grammar Diction - Usage
Presentation-25	Technical Writing Style Report Format

*This assignment is modeled after a design problem given in EE 207.

WRITING LAB ASSISTANCE

The Writing Lab, located in Heavilon Hall, offers assistance in technical writing to students and faculty at Purdue University through a variety of services. As the demand for technical writing help increased in recent years, the Writing Lab responded by expanding its programs to include:

- for students, tutorial instruction (instructors with training in technical writing offer this assistance)
- for students, self-instruction materials which specifically address technical writing concerns
- for classes & students, traveling teacher sessions and workshops on technical writing topics
- for faculty & students, resource materials and hand-outs specifically focused on technical writing concerns
- for students, computer-aided instruction programs useful for technically oriented writing
- with faculty, consultation services, discussions & conferences to explore and develop new ways to address technical writing needs across the campus.

Following is a brief discussion of each type of service offered.

Tutorial Instruction

Students may receive tutorial instruction in one of the following ways:

- Appointment. Tutorial appointments are usually 1/2 hour and focus upon individualized instruction. A variety of materials and approaches are used to help students master specific writing skills that they lack. Students may request the same tutor for each session or seek assistance from different instructors in the lab. Appointments are initiated by the student and scheduled through the Writing Lab receptionist.

- Drop-in. Some time each day has been set aside when Writing Lab instructors have no scheduled appointments and are available to offer immediate help to students. This time of useful service is offered on a "first come, first served" basis for students to drop in with a quick question or to determine if more intensive help is needed. Students also find this time helpful for pre-writing discussion of a topic. Students can check at the receptionist's desk to find out when drop-in hours are each day.

- Computer. For a specific course and with prior arrangement with the faculty in charge, students may send report sections or technical writing assignments to the Writing Lab via the computer using the Engineering Computer Network UNIX system. Comments on technical writing style and form will be made by trained Writing Lab instructors and returned via the terminal to the students. (Additional suggestions on computer-aided instruction are found in Section Three of this handbook.)

In addition to help given for specific writing assignments, students in technical courses often request tutorial assistance for basic writing skills, job applications and resumes, college entrance essays, and graduate proficiency examinations in composition. The Writing Lab offers tutorial help in all of these areas.

Self-Instruction Materials

The Writing Lab maintains an extensive set of multi-media self-instruction modules which can be used to supplement verbal instruction. These modules cover most of the standard topics in grammar, rhetoric, spelling, and vocabulary. (A listing of self-instruction materials is available through the Writing Lab.) Also, tapes on business reports, business letters, and business communication are available.

Five self-instruction modules-Clarity, Conciseness, Consistency, Frequent Grammatical Errors, and Report Formats-have been specifically designed for technical writing. Clarity covers issues of clarity in defining the purpose and context of a report; the use of examples, transitions, specific detail, and visuals; suggestions for clearer sentence structures; and ways to avoid jargon and vague words. Conciseness offers suggestions for eliminating unnecessary information and redundant words. Consistency covers issues of voice; pronoun shifting; dangling modifiers; verb tense consistency; subject-verb consistency; and pronoun number consistency. Frequent Grammatical Errors covers fragments; compound sentence punctuation; commas; hyphens; apostrophes; quotation marks; capitals; and spelling. Report Formats covers purposes and types of formats; discusses parts of a report: body, abstract, mechanical elements; and gives report samples.

Each module takes approximately one to two hours to complete and includes exercises and quizzes to use. To use the self-instruction modules no appointments are necessary, and instructors are encouraged to preview any of these materials.

Traveling Teachers and Workshops

Currently the Writing Lab offers one-hour sessions suitable for a classroom setting or for a large lecture presentation on three technical writing topics; technical writing style, technical writing formats, and technical writing modes. "Style" covers issues of accuracy, brevity, and completeness in report writing in order to achieve a clarity of presentation. A detailed description of writing concerns covered in this topic is found in Appendix A. "Formats" describes the content differences between major technical report formats. Primary and secondary elements in report formatting are defined, and the main narrative of a report is analyzed as a writing with a beginning, middle, and end. Appendix B outlines major technical report formats. "Modes"

presents description, definition, and inferential writing (multiple evaluation, cause-effect, conclusion-recommendation) as used in technical writing. All three sessions include hand-outs, visual presentations, and numerous examples, in addition to lecture and discussion.

Additional topics for traveling teachers and workshops can be developed, and faculty are encouraged to request new subjects or reinforce current offerings. (See section on consultation). To arrange for current sessions, contact Professor Muriel Harris, Director of the Writing Lab (Telephone, 49-43723).

Instructional Hand-outs, Resource Materials, Library

Each year faculty and students make several thousand requests for instructional materials from the Writing Lab. An extensive listing of both hand-outs and other resources is available from the Writing Lab. In addition, development of specific materials for technical writing has been made possible through funding from the Office of the Dean of Engineering at Purdue and will include hand-outs and instructional materials for students in the following areas:*

- Abstracts - descriptive and informative
- Technical Report Formats - an outline and description of contents
- Description in technical writing (including examples)
- Definition in technical writing (including examples)
- Inferential Writing; multiple evaluation, cause-effect, conclusion-recommendation

*These materials should be available by the end of Fall Semester '84.

Additional resources will be added to the Writing Lab's technical writing file as financial support and the instructional abilities and expertise of staff allow.

The Writing Lab library and resource center contains most of the journals in rhetoric and composition, professional books for teachers of composition, and many reference books and maintains a special area designed for technical writing interests. For students there are reference books, format and style manuals, dictionaries, a thesaurus, copies of most of the composition textbooks and a library of other books on writing. Students and faculty are invited to come in and browse, check out books and materials, and use the lab as a writing room or reference center for writing. The Writing Lab is continually updating its library-resource holdings to reflect current interests and research in composition.

Computer aided Instruction

The addition of microcomputers in the Writing Lab has provided access to word processing, to computer-aided instruction, and to resume formatting for students. The Writing Lab staff undertakes evaluation and review of computer software programs and computer writing cabilities in order to continue growth and development of services in this expanding area of composition.

Also an Engineering Computer Network (ECN) terminal provided by the office of the Dean of Engineering and a Honeywell printer provided by the Electrical Engineering Department enable staff to interact with faculty and students using the ECN UNIX network. Electrical Engineering, Civil Engineering, and Mechanical Engineering students have interacted with the Writing Lab using this computer facility. Students send their reports or questions via the MAIL Program to the Writing Lab, and staff enter comments and suggestions before returning these reports to the students' logins.

Section three of this report provides a detailed discussion of the potential uses of computer-aided instruction for technical writing.

Consultation Services

The Writing Lab invites faculty throughout the university to consult with the staff regarding student writing needs. Particular emphasis on technical writing concerns has resulted in experimental instruction and research-oriented programs in writing. Specific areas discussed include:

- Cooperating with the Writing Lab to develop materials and to offer services in technical writing to engineering and other faculty.
- Participating in grant applications to request funding for experimental instruction and research-oriented programs in composition which emphasize technical writing.
- Offering English credit in engineering and technical courses which include a writing component as part of their requirement.
- Including a technical writing instructor as consultant/staff for students in courses demanding technical report writing.
- Incorporating computer instruction as a basic component in technical writing for engineering and technically oriented students.

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COMPUTER AIDED ASSISTANCE

Word Processing and Text Editing

Most Purdue University students involved in technical disciplines are familiar with and use computers, and many of them know microcomputer or mainframe computer word processing programs which they utilize when writing papers. Informal analysis suggests that these programs facilitate the writing process for some students, supporting the idea that writing on the computer can be a "freeing" and sometimes enabling experience. This seems especially true for those students who have developed negative attitudes about their writing abilities. Further, the advanced technology and exponential growth within the computer field open instructional possibilities within all disciplines. At the same time, this development and growth challenge educators to maintain a corresponding awareness of the advantages and drawbacks of computer applications. For example, some teachers of writing view the computer as a true "mentor" (Schwartz 141) while others approach this innovation as a "monster" (Oliver 410). No superficial "cure-all" for writing competency can possibly be achieved using computer-aided writing. However, for students in technical and engineering disciplines, practice with and an awareness of this method of writing could prove valuable, and a receptive, critical attitude towards such instruction seems desirable. Therefore, with the conviction that "word processing is a versatile tool for helping writers learn how to write, with the powerful potential to change radically the ways we teach, learn and perceive writing" (Sommers 1), several general recommendations are made to assist such students.

For help in organizing material and developing ideas, ENCOURAGE students to do PREWRITING on the computer. A new class of software called "Thought processors" could aid students in this first stage of the writing process. "Think Tank" (available in the Writing Lab) and THOR (The 57) are two such programs. Technical writing requires precise organization and structure, and this exploratory phase in writing is crucial in composing professional, well-written reports. Michael N. Milone, Jr. maintains that the most powerful use of the word processor is probably in this prewriting, or planning, stage. He asserts, "A word processor allows students to enter, organize, and edit their thoughts easily, thus building a strong foundation of ideas from which drafting can be initiated" (Milone 6).

Because of the versatility of the computer for use in revising writing, INVITE, whenever possible, initial drafts with the condition that REVISION must be done and final drafts are expected. Teachers of writing generally agree that revision is an essential step in producing competent writing, and computer-aided composition can help eliminate some of the tedious work students associate with this task.

Given the creative capabilities of computer text editing programs to format manuscripts, have students EXPLORE the use of computer writing in order to increase the ease of producing PROFESSIONAL-LOOKING reports. Technical writing prescribes formats and emphasizes overall design and appearance. Because of the importance of appearance and correct formatting in technical writing, REMIND and CAUTION students using the computer for their writing to be aware of the difference between text formatting and word processing programs. Several microcomputer programs join these two functions into one integrated program; however, many main-frame editors require that text-formatting commands be embedded during the actual writing and that a separate program be run after the text has been entered. (Examples of this latter type are NROFF and TROFF Programs on the UNIX System at Purdue University.)

In order to use faculty time efficiently and to aid in the demanding critiquing process, CONSIDER using the computer to enter comments and to assist in the EVALUATION of student reports. A successful pilot project in this area was conducted at Purdue University in the Spring Semester,'83.

The Writing Lab in conjunction with the Electrical Engineering Department offered writing instruction to students enrolled in EE 207. Students submitted reports via the terminal, and Writing Lab instructors read, evaluated, and returned these reports with comments to students' logins. (Harris and Cheek 5) (Copies of this article are available through the Writing Lab.) Also to assist in the critical process, evaluation programs similiar to those developed by Mill Marling and Jack Jobst (Jobst 5) could be written.

For further suggestions on writing analysis and evaluation programs, see the following section on Writer's Workbench.

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Writer's Workbench

Writer's Workbench is a set of text-analyzing programs produced by Bell Labs and available at Purdue University on the UNIX computer system.* As a means of analyzing surface-level problems in students' writings, it assists teachers with some of the tedious editing and proofreading tasks, thereby giving the teacher more time to consider larger rhetorical questions of organization and structure, and content issues of accuracy and completeness. Several articles on Writer's Workbench have been written, and a controversy exists regarding the usefulness of this and other similiar programs. A brief description and critique of the program follows in order to clarify some of the issues particularly relevant to technical writing. Analytical comments are only given for those modules used by the writer and focus on information of particular significance in addressing problems and concerns in technical writing. (For a more detailed explanation and discussion of Writer's Workbench, see the bibliography section of this handbook.)

SPELLWWB prints out all words in the student's writing that are misspelled or that do not appear in its 30,000 word dictionary. This program allows users to have their own dictionary of additional words --- a feature of some usefulness to technical writers who may wish to add specific words from their own disciplines. Also the program can be used interactively to correct spelling errors by prompting the user with all possible spelling errors and then presenting several alternatives from which the writer can choose for a response. Unfortunately this spelling checker cannot detect homonym confusions, such as to/too, there/their/they're, and its/it's, nor can it correct the misuse of correctly spelled words, such as effect/affect. Both types of errors commonly occur in students' technical reports.

*Writer's Workbench includes several modules. Three of these , Style, Diction and Spell, were available at Purdue University in 1983-84. Comments and analysis presented in this handbook are based upon the use of these segments of the program. This writer hopes that the total Writer's Workbench package will be made available to faculty and students at Purdue University in the near future.

PUNCT searches for simple punctuation errors such as capitalizing the first letter of a sentence or warns of unbalanced double or single quotes and parentheses. The rules PUNCT enforces are straightforward, and the program does not deal with other major punctuation needs. For example PUNCT does NOT locate sentence punctuation errors, does NOT deal with correct usage of punctuation marks such as the comma, and does NOT address questions of punctuation choice or ambiguity. Students writing technical reports often ask these types of questions and request help in improving their skills in these areas.

DOUBLE locates the consecutive occurrence of the same word, an error often difficult for human proofreaders to detect.

DICTION, SUGGEST moves beyond simple editing suggestions by flagging possibly wordy or ineffective constructions and by asking the writer to consider revising them. This program contains an expandable file of 450 words and phrases to avoid, reprints sentences from the student's report which contain these words or phrases, and brackets the construction, as shown in the following student example.

> The difference between AC and DC coupling lies in [the fact] that with the DC coupling the circuits are coupled directly.

While "the fact" is indeed unnecessary verbiage, writing instructors might be more inclined to have the student consider whether the whole phrase, "lies in the fact that" might simply be replaced by "is that". SUGGEST recommends the substitutions for the phrases flagged by DICTION. Thus, as in the preceding example, while the suggestions for revision in the DICTION program do surface some potential problems, teachers should not rely entirely on this program's output. However, its usefulness can be enhanced by adding to its expandable list such word clutter as "is due to the fact that," a student favorite in technical writing, and a phrase which is apparently not in the present DICTION listing. Thoughtful use of DICTION and SUGGEST could aid students in achieving conciseness, an important objective in technical report writing.

SPLINTINF finds infinitives that are split by adverbs such as "to immediately progress." This construction is the most common type of split infinites and often interferes with clarity in technical writing.

STYLE provides information about the stylistic features of a text based on a parts of speech analysis. It lists readability levels on three scales -- the Kincaid, Coleman-Liau, and the Flesch -- and gives sentence-level information such as the total number of sentences, total number of words, and average number of non-function words, the number of words in the longest sentence, and the percentage of sentence types. Its analysis of word usage includes the percentage of "to be" verbs, passive constructions, and different types of sentence openers. Information contained in this program, such as passive constructions, sentence length, and sentence variety, can be valuable in revising for good technical writing style. However, although technical writers often overuse nominalizations and are encouraged to write in the "active" not "passive" voice, users may not know the meaning of these terms nor be able to revise accordingly. The questions remain, "what is the significance of a certain percent of passive, or what is the meaning and importance of an expletive as a sentence opener?" STYLE is useful in providing data but requires some supportive interpretation in order to be helpful in suggesting ways to revise and improve a composition.

PROSE overcomes some of the drawbacks of the STYLE module. It compares the style values of the writer's text against a set of standards and describes the difference in a rather lengthy output. An additional advantage of this program is that users can select from a set of standards for interpretation of their texts. Most importantly here, PROSE has built-in standards for technical papers which are presented in its selection alternatives.

FINDBE attempts to improve a text by locating all forms of the verb "to be" and tries to rewrite them. This program provides easy formatting for revision of a text. Although this writer has not had direct experience with FINDBE, information from articles prompts some cautionary note. Active voice is <u>generally</u> preferred in technical reports; however there are instances when passive voice is necessary and should be used. An overly zealous student could revise a text based on the output of FINDBE only to create errors or to increase awkwardness of style.

WORDUSE provides a brief description of the correct use of over 300 English words and phrases that are commonly confused, such as affect/effect, principle/principal, etc.

SPELLTELL provides the correct spelling given any correct part of the word if it is one of the 800 commonly misspelled words in the SPELLTELL dictionary. After a writer types in some correct part of a word, the program displays all the words in its dictionary that contain that pattern. This program addresses the frequent complaint students have about how to find a word if the user does not know how to spell it.

WWBINFO and WWBHELP provide on-line information about Writer's Workbench. WWBINFO prints a list of all the program and their functions, and WWBHELP accesses a list of functions and program names.

ORG-SEXIST-ABST create additional output about language and the structure of a writing. ORG provides information about paragraph structure. It prints the first and last sentence of each paragraph. Frequently students express difficulty in writing report abstracts, and this program offers one possible approach to solving that problem.

SEXIST contains a dictionary of 100 possibly sexist words and phrases and provides a table of possible substitutions. Technical reports written for government and equal-opportunity-employers prohibit the use of sexist language. This program provides helpful assistance to writers in providing alternatives.

ABST indexes the conceptual abstractness of the writing based upon the percentage of words in the text that also occur in a list of 314 words rated as abstract in psychological research. It further suggests concrete examples that may be substituted. Concrete, definitive language is a plus in technical writing style; thus this program gives useful information to the writer of reports.

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APPENDICES

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APPENDIX A

Technical Writing Style

The goal of technical writing is CLARITY. A formula to achieve that goal is a+b+c= clarity

Where: a=accuracy, b=brevity, c=completeness.

To Be Accurate	To Be Brief	To Be Complete
• quantify	• use graphic aids	• write from general to specific
• avoid loaded words	• avoid vague words	• write complete sentences
• use clear pronoun referents	• avoid redundancies and repetitious words	• include necessary function words
• use correct agreement	• avoid unnecessary jargon	

General Characteristics and Conventions of good technical writing style include:

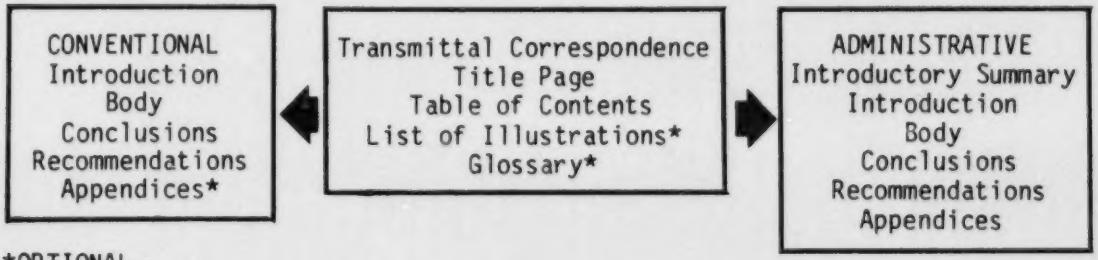
- Objective Tone (not emotional, not personal, not moralistic)
- Consistency of form and style
- Listing (must be in parallel form)
- Active Voice whenever possible
- Third Person (except in Manuals of Instruction)
- Prescribed Formats
- Repetition and Summary
- Graphic Aids or Illustrations
- Analogy to describe complex material

APPENDIX B

Report Formats

Careful audience analysis governs the choice of basic report formats; therefore, knowledge of who reads technical reports and for what purpose is essential. Audience awareness and the increasing need for concise and effective communication suitable to a variety of readers has resulted in the design of two basic formats, the Conventional and the Administrative (also called the Executive or Modern). The Administrative format is intended for persons who want a concise summary of the report and who do not require that all supporting details be in the main body of the report. The Conventional format is intended for an audience who will base decisions upon a close analysis of data and who reach conclusions after reading all technical and supporting information and evidence. To meet these audience needs, in the Administrative format an Introductory Summary serves as a mini-report and the Appendices function as a primary element containing supporting details. These two elements, the Introductory Summary and the Appendices, greatly increase the report's flexibility. In the Conventional format supporting detail is included in the body of the report, and the Appendices are considered optional sections.

The diagram below presents a summary of differences between these two formats.



*OPTIONAL

The Introduction, Introductory Summary, Body, Conclusions, Recommendations, and in the case of the Administrative format the Appendices, usually are referred to as the Primary Elements of the report. Together these sections comprise the continuous prose or narration.

Following is a general listing of Primary Elements for major report types.

REPORT CONTENT - PRIMARY ELEMENTS -( )USED ONLY FOR ADMINISTRATIVE FORMAT

- DESIGN
  - (Introductory Summary)
  - Introduction
  - Standards and Specifications
  - Methods and Procedures
  - List of Components and Costs
  - Design Presentation-Overall, Steps, Function
  - Evaluation based upon Standards and Specifications
  - Conclusions
  - Recommendations
  - (Appendices)
- FEASIBILITY
  - (Introductory Summary)
  - Introduction
  - Standards and Specifications or Criteria
  - Methods and Procedures
  - Presentation of Data
  - Discussion of Data or Outcome
  - Conclusions
  - Recommendations
  - (Appendices)
- MANUAL OF INSTRUCTION
  - Introduction
  - Theory or Principle of Operation
  - List of Equipment, Materials, Personnel
  - Description of Mechanism or Process
  - Performance Instructions Including Cautions
  - Trouble Shooting Section
- JOURNAL ARTICLES
  - May follow any of above formats
  - Use guidelines provided by Journal
- PROGRESS
  - (Introductory Summary)
  - Introduction
  - History of Project
  - Present Status-Work Completed
  - Implications-Work Scheduled or Proposed
  - Conclusions
  - Recommendations
  - (Appendices)
- PROPOSALS
  - (Introductory Summary)
  - Introduction
  - Statement of Purpose
  - Proposed Plan of Operation or Development
  - Criteria for Evaluation
  - Personnel, Equipment, Money Available
  - Personnel, Equipment, Money Needed
  - Detailed Support, Financial Statement, Resumes
  - Implications
  - Conclusions
  - (Appendices)
- PHYSICAL RESEARCH
  - (Introductory Summary)
  - Introduction
  - Literature Review
  - Presentation of the Problem
  - Methods and Materials
  - Presentation of Data - Results
  - Discussion of Data
  - Conclusions
  - Recommendations
  - (Appendices)

APPENDIX C

Illustrations

Graphic Aids, Visuals, Etc.

All illustrations can be divided into two main categories:

- TABLES - Data Organized into columns (vertical) and rows (horizonal).
- FIGURES - All Others. (Any visual that is not a Table; e.g. graphs, diagrams, charts, photographs, etc.)

Labeling

All Illustrations must have:

- A Title
- A Number

TABLES should be labeled in upper case at the top of the illustration.

Figures should be labeled in upper/lower case at the bottom of the illustration.

Following are several examples.

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Correct Labeling for Complex Drawing

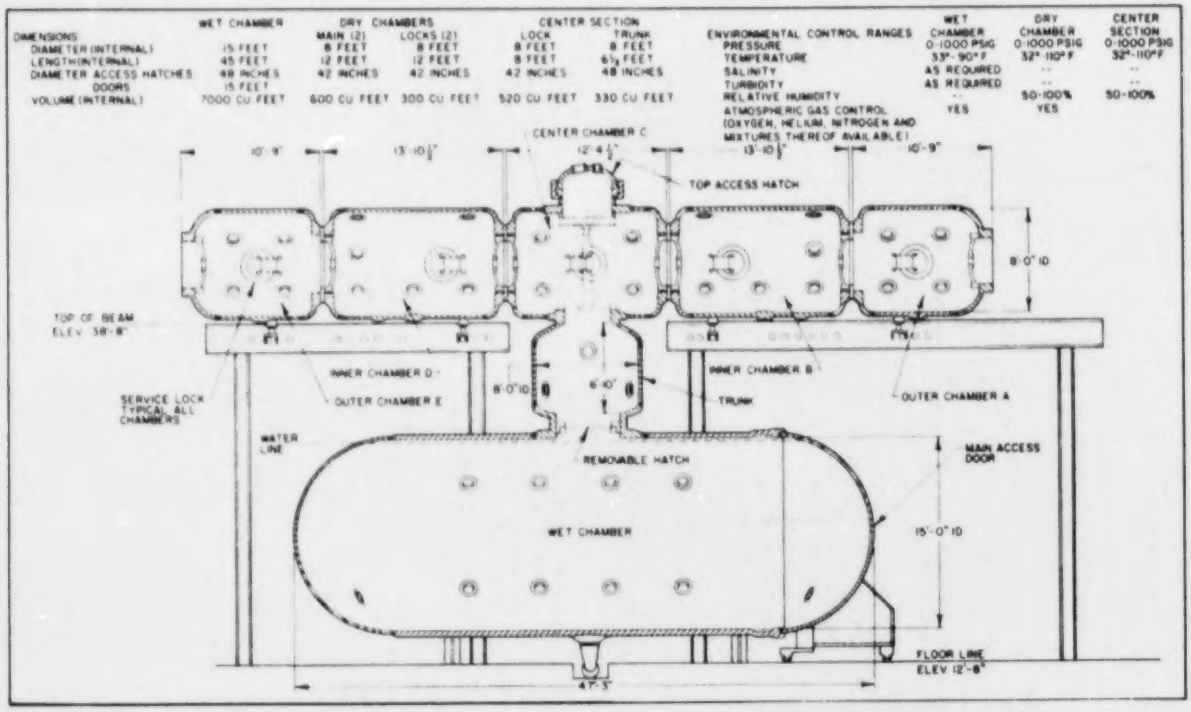

Figure 4 - Ocean Simulation Facility Hyperbaric Chamber Complex (Elevation Cross Section)

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Correct Labeling for Figures

Figure 1 - Flowchart of Landsat System

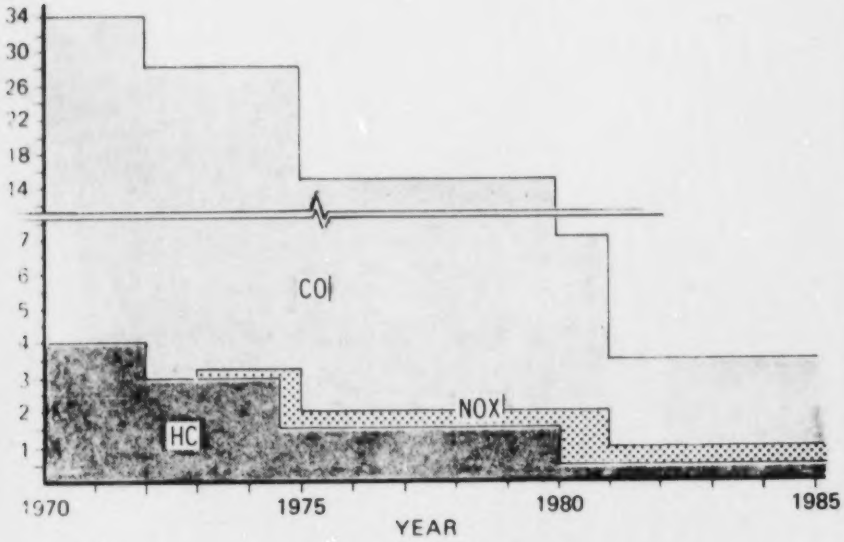

Figure 2 - Change in Emission Standards

Primitive

Character Count	First Character
Second Character	Third Character
Link Address	
Executable Machine Code	
RET	

Secondary

Character Count	First Character
Second Character	Third Character
Link Address	
CALL First Word	
CALL Second Word	
. . .	
CALL Last Word	
RET	

Figure 3 - Organization of Primitive and Secondary Words of a Subroutine Threaded Interpretive Language

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Correct Labeling for Tables

TABLE 1 - FACTORS AFFECTING FUTURE OF LANDSAT SYSTEM

TECHNICAL FACTORS	LEGAL/INSTITUTIONAL FACTORS	ECONOMIC FACTORS
MATURITY OF REMOTE SENSING APPLICATIONS	WHITE HOUSE PRIORITY	TECHNOLOGY TRANSFER/ TECHNOLOGY DIFFUSION
MULTI SOURCE ENVIRONMENTAL DATA INTEGRATION	CONGRESSIONAL ACTION	LANDSAT D FUNDING
DIGITAL PROCESSING TECHNIQUES	EARTH RESOURCE OBSERVATORY SATELLITE (EROS) MANDATE	EROS FUNDING
THEMATIC MAPPER DEVELOPMENT	NASA OFFICE OF APPLICATIONS MANDATE	NASA FUNDING
SPACE SHUTTLE SCHEDULE	DOMESTIC/INTERNATIONAL REGULATION	PRIVATE INVESTMENT
TELEMETRY & DATA RELAY SATELLITE SYSTEM SCHEDULE	PRIVATE INITIATIVE	MARKET STIMULATION
MASTER DATA PROCESSOR EROS DIGITAL SYSTEM SCHEDULE	FOREIGN AGREEMENTS	FOREIGN INVESTMENT
MASS DATA STORAGE RETRIEVAL TECHNOLOGY	UNITED NATIONS ACTION	USER DEMAND

TABLE 2 - CROP CALENDAR IN GARDEN LANDS

Crop Sequences	Sowing Period	Harvest Period
A. *Seasonal Crops*		
1. Paddy	June – July	Sept – Oct
Paddy	Oct – Nov	Feb – March
Pulses	Feb – Sept	Jan – Feb
2. Paddy	Aug – Sept	Jan – Feb
Millets	March	June
3. Paddy	July – Aug	Dec – Jan
Bajra	January	March
Sorghum	April	June
4. Groundnut	Jan – Feb	April
Paddy	July	November
5. Cotton	Aug – Sept	February
Sorghum	March	June
6. Paddy	July – Aug	Nov – Dec
Vegetables	Jan – Feb	May
7. Paddy	October	Jan – Feb
Cotton	Feb – March	September
8. Chillies	September	Jan – Feb
Bajra	February	April – May
B. *Annual crops*		
Sugarcane	Jan – Feb	Dec – Jan
Banana	Nov – Feb	Nov – Feb

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